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*Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

*Therefore, this*

## United States Patent

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US008343016B1

(12) **United States Patent**
**Astilean**

(10) **Patent No.: US 8,343,016 B1**
(45) **Date of Patent: Jan. 1, 2013**

(54) **LEG-POWERED TREADMILL**

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( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 156 days.

(21) Appl. No.: **12/925,892**

(22) Filed: **Nov. 1, 2010**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 12/925,770, filed on Oct. 29, 2010.

(60) Provisional application No. 61/280,265, filed on Nov. 2, 2009.

(51) **Int. Cl.**
*A63B 22/02* (2006.01)

(52) **U.S. Cl.** ..... **482/54**

(58) **Field of Classification Search** ..... 482/23, 482/37, 51, 54, 69–71, 79; 119/700; 434/247, 434/255; D21/662, 668–669; *A63B 22/02*
See application file for complete search history.

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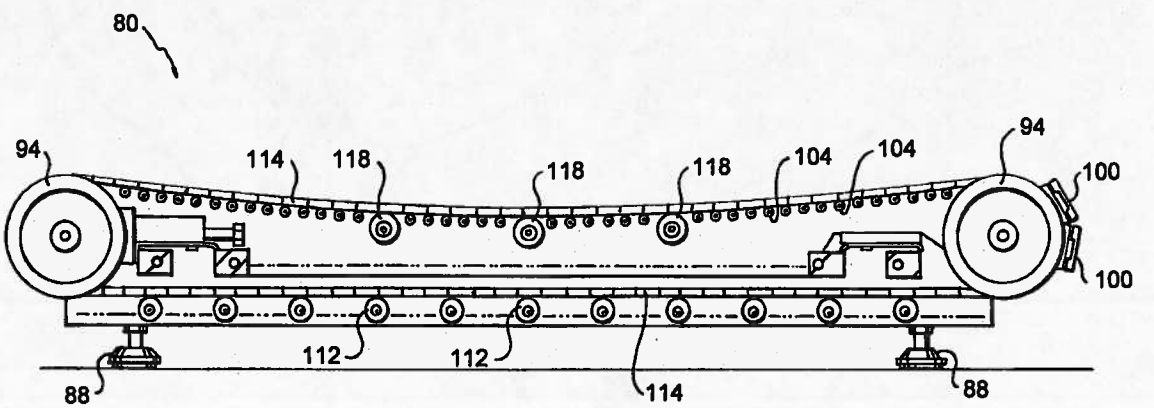
(57) **ABSTRACT**

A motor-less leg-powered curved treadmill produced that allows people to walk, jog, run, and sprint without making any adjustments to the treadmill other than shifting the user's center of gravity forward and backwards. A closed loop treadmill belt is formed with a low friction running surface of transverse wooden, plastic or rubber slats attached to each other in a resilient fashion. Since an essential feature of treadmill is the concave shape of the running surface of belt in its respective upper portion, curved and linear arrays of bearings are used to insure that this shape is maintained during actual use. These bearings prevent the lower portion of the treadmill belt from drooping down (i.e.—it must be held taut), to prevent the top portion to be pulled taut into a flat shape between the front and rear pulley rollers.

**17 Claims, 8 Drawing Sheets**



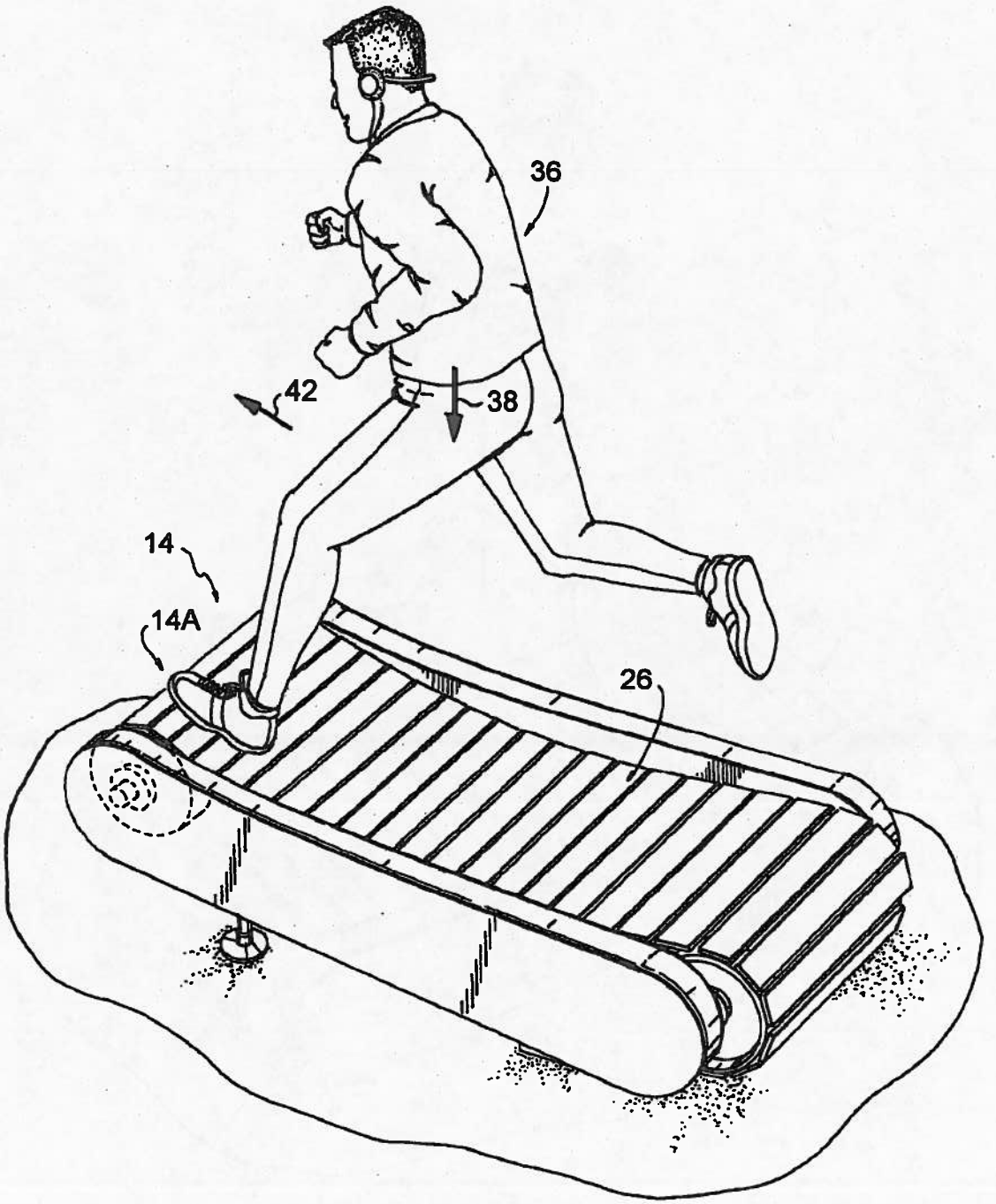



Fig. 1A

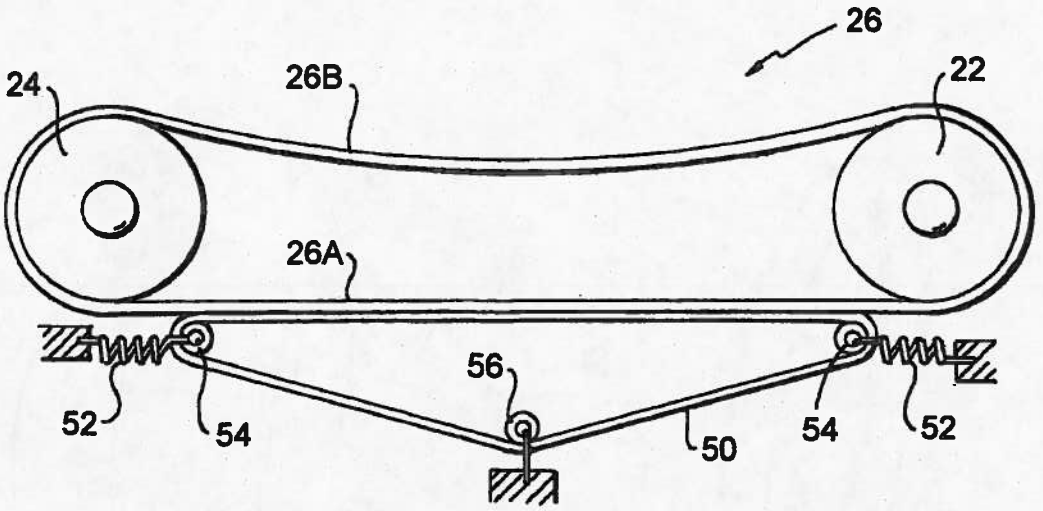



Fig. 2

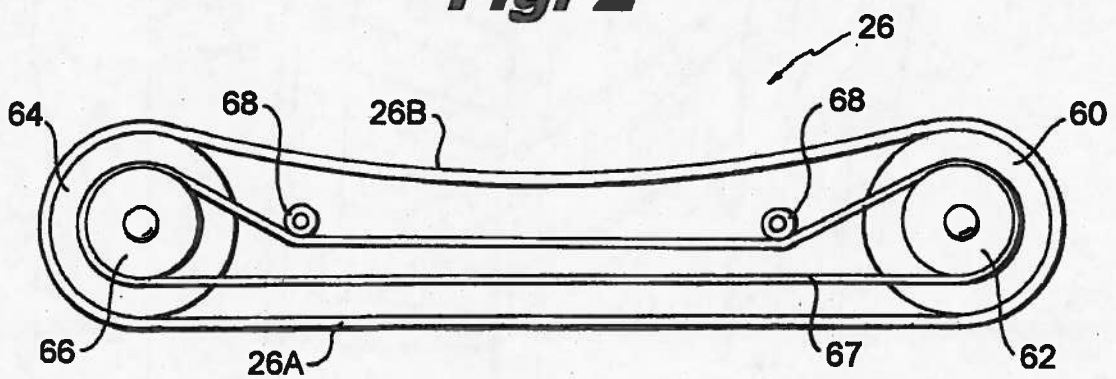



Fig. 3

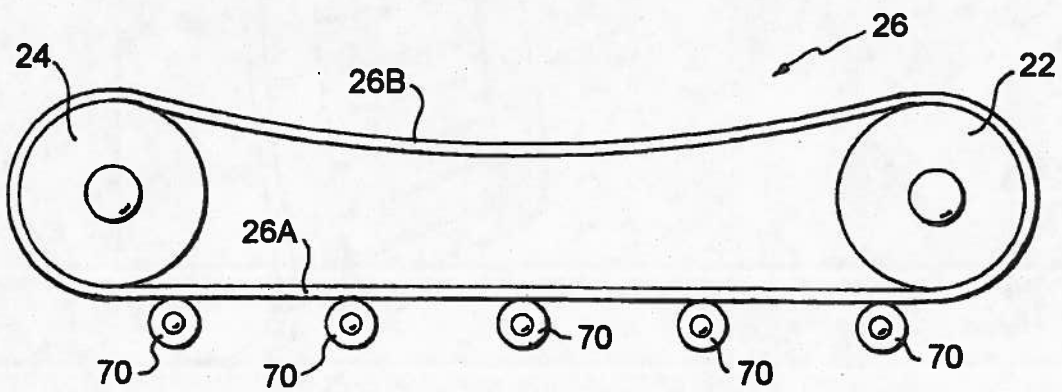



Fig. 4

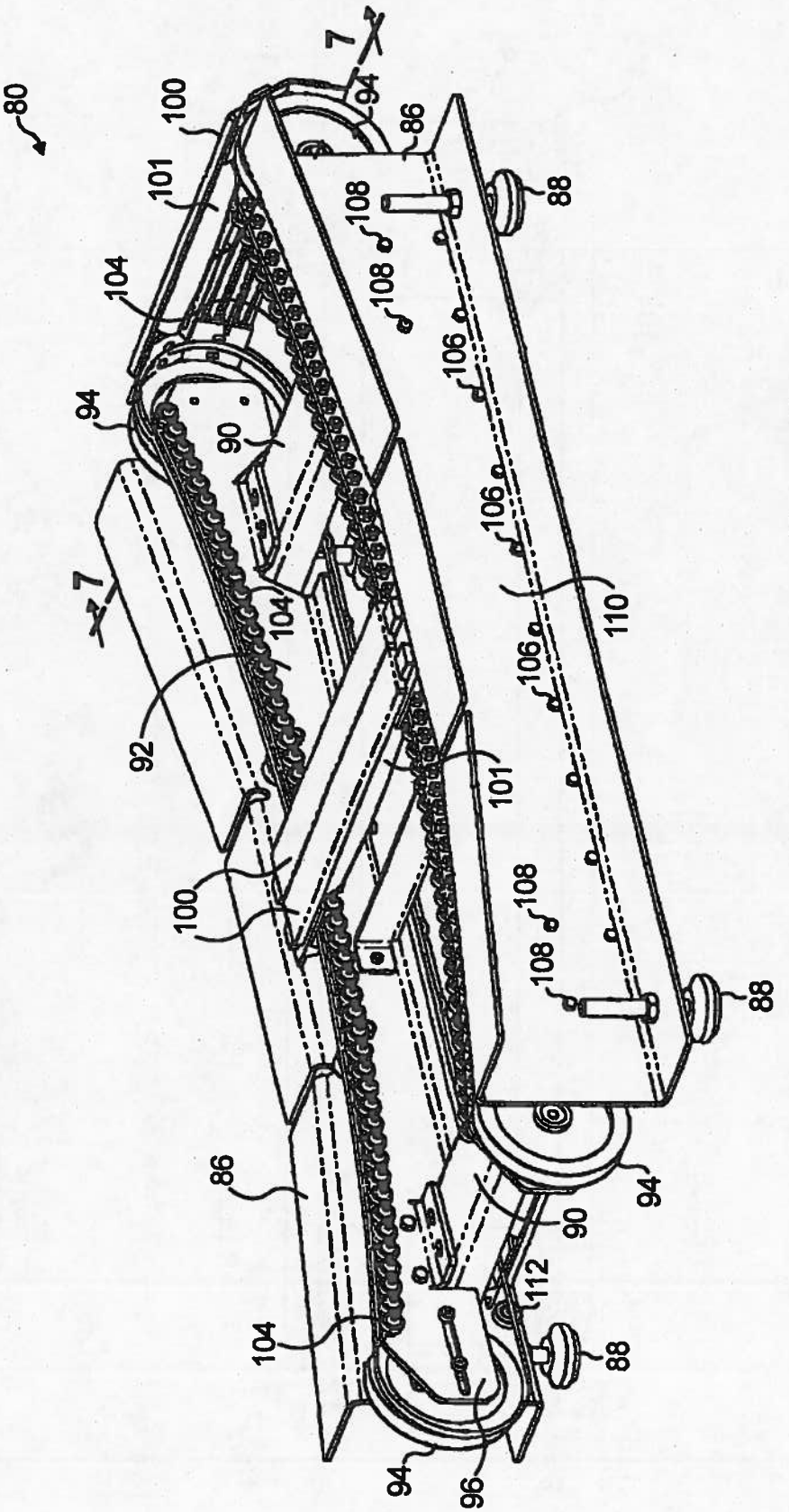



Fig. 6

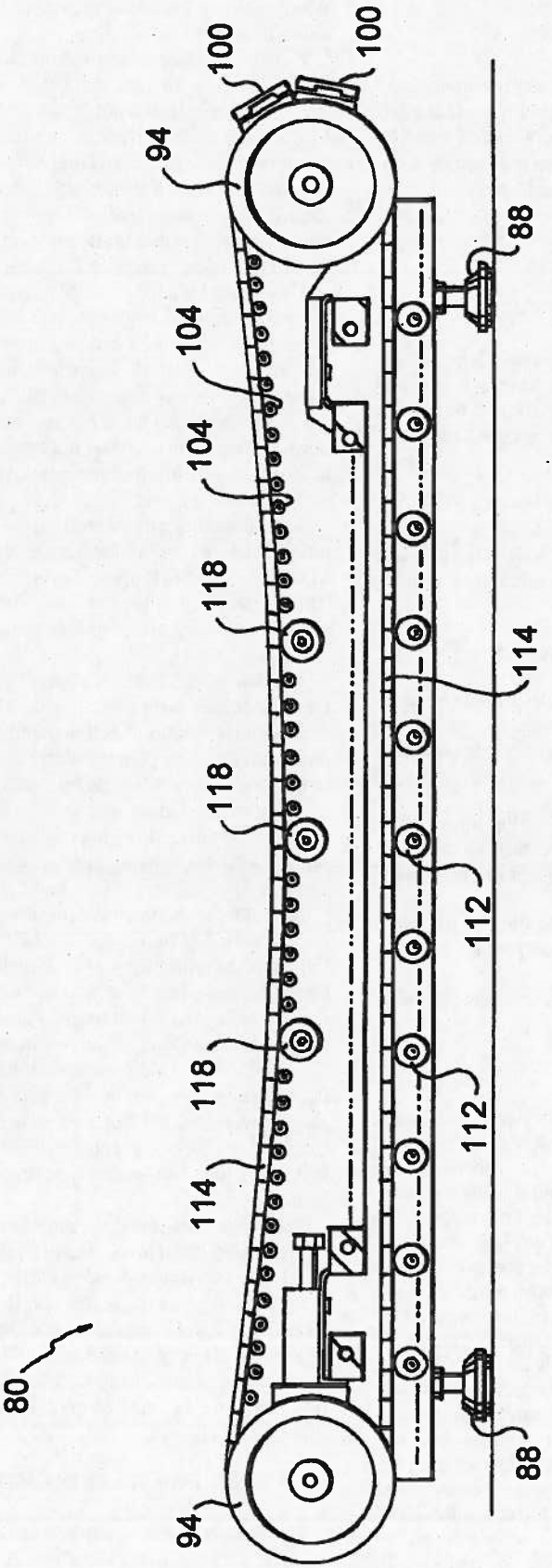



Fig. 8

FIG. **1** is a perspective view of the exterior of one embodiment of the present invention; showing the runner in a slow walk in the droop of the concave upper portion of the treadmill ball.

FIG. **1A** is a perspective view of the exterior of the embodiment in FIG. **1**, showing the runner running at a fast pace uphill.

FIG. **1B** is a perspective view of the exterior of the embodiment in FIG. **1**, showing the runner running slowly in the droop of the concave portion.

FIG. **2** is a diagrammatic side view of the system components for the embodiment of FIG. **1** for implementing the present invention.

FIG. **3** is a diagrammatic side view of the system components for a second embodiment for implementing the present invention.

FIG. **4** is a diagrammatic side view of the system components for a third embodiment for implementing the present invention.

FIG. **5** is a perspective view of the third embodiment shown in FIG. **4**, having a v-belt and a lower linear array of ball bearings in the curved treadmill, and showing an optional removable handlebar assembly.

FIG. **6** is a perspective view of the curved treadmill embodiment of FIG. **5** having a v-belt and a lower linear array of ball bearings, with the side covers and treadmill belt removed to reveal the various operating parts.

FIG. **7** is an end view of the curved treadmill embodiment of FIG. **5** having a v-belt and a lower linear array of ball bearings, illustrating the support of a top slat and a bottom slat using the side extension features of the custom v-belt.

FIG. **8** is a side elevation of the v-belt treadmill chassis of the embodiment of FIG. **5** with a v-belt and a lower linear array of ball bearings, showing the supported path of the v-belt; wherein the vertical side of the outer frame member is rendered invisible for clarity of detail.

## DETAILED DESCRIPTION OF THE DRAWINGS

The description of the invention which follows, together with the accompanying drawing should not be construed as limiting the invention to the example shown and described, because those skilled in the art to which this invention appertains will be able to devise other forms thereof.

FIG. **1** is a perspective view of a leg-powered treadmill **10** constructed and having an operating mode according to the present invention.

As noted in FIG. **1**, no hand rails are shown. The curved treadmill **10** can be used without hand rails. Hand rails can be optionally provided for non-athletes with balance or running stabilities limitations.

Illustrated are two leg supports **10** and **12** which lift the treadmill **14** in a clearance position above a support surface **16**, said treadmill **10** having space apart sides **18** and **20** which have journalled for rotation end rollers **22** and **24** which support a closed loop treadmill belt **26**. Low friction methods to be described are used to hold taut the length of the lower belt portion **26A** in a dimension of approximately forty-three inches denoted by dimension line **30**. The upper belt portion **26B** weighs approximately forty pounds is also denoted by the dimension line **30**.

It is to be noted that an essential feature of treadmill **10** is a concave shape subtending an acute angle **34** in the treadmill **10** front end **14A** which in practice results in the exerciser **36** running uphill and concomitantly exerting body weight **38** that contributes to driving lengthwise **40** in the direction **42** in which the exerciser runs and achieves the benefits of the exercise. As the runner **36** encounters the different positions on the treadmill belt **26** of the treadmill **14**, the angle of the surface of running changes For example, as shown in FIG. **1**, when the center of gravity of body weight, indicated by downward directional arrow **38**, below the hips of the user **36**, is in the lower dropping portion of the concave upper portion **26B** of the treadmill belt **26**, the runner **36** walks or slowly jogs in a generally horizontal orientation, as indicated by directional arrow **42** in a first slow jogging speed. But, as shown in FIG. **1A**, as the runner **36** speeds up and advances the runner's hips and center of gravity of body weight further forward up the angled slope at the front end **14A** of the treadmill belt **26**, the angle of movement **42** changes from a generally horizontal angle **42** in FIG. **1** to an acute angle **42** up off the horizontal as in FIG. **1A**, which concurrently causes the runner **36** to run vigorously faster, at the acute angle **42** up the slope of the front **14A** of the concave curve of upper belt portion **26B** of treadmill belt **26**, the runner **36** runs faster uphill. Furthermore, as shown in FIG. **1B**, it does not matter where the runner **36** puts the forward foot to change the speed. In FIG. **1B** the center of gravity in the hip region of the runner **36**'s body weight, indicated by downward directional arrow **38**, is still in the lower part of the concave droop of the upper portion **26A** of treadmill belt **26**. So even though the runner **36** in FIG. **1B** is jogging faster than walking or slowly jogging as in FIG. **1**, so long as the runner **36** has the forward foot partially up the angled slope of the forward portion **14A** of the upper belt portion **26B**, the runner will still run slower in FIG. **1B**, not because the forward foot is up the slope of upper belt portion **26B** of the treadmill belt **26**, but because the center of gravity of body weight, as indicated by downward directional arrow **38**, is still within the lower confines of the droop of the concave upper belt portion **26B**. Therefore, what changes the speed of the runner **36** and the treadmill belt **26**, is when the runner **36** moves the center of gravity of the hips of the body weight indicated by downward directional arrow **38** higher up the slope of concave upper portion **26B** of treadmill belt **26**, which causes the runner to run faster and the belt **26** to concurrently move faster around pulleys **22** and **24** with the pace of the forward advancing runner **36**.

It is known from common experience that in prior art treadmills, the upper length portion of their closed loops are flat due, it is believed, because of the inability to maintain the concave shape **34** in the length portion **26B**. This shortcoming is overcome by the weight **30** which in practice has been found to hold the concave shape **34** during the uphill running of the exerciser **36**.

A closed loop treadmill belt **26** is formed with a running surface of transverse wooden, plastic or rubber slats **49** (see FIG. **1**) attached to each other in a resilient fashion. Since an essential feature of treadmill **10** is the concave shape of the low friction running surface of belt **26** in upper portion **26B**, methods are used to insure that this shape is maintained during actual use. These methods must prevent the lower portion **26A** of treadmill belt **26** from drooping down (i.e.—must be held taut), otherwise top portion **26B** would be pulled taut into a flat shape between rollers **22** and **24**. Three methods are illustrated by the side view schematic drawings of FIGS. **2-4**.

The method of FIG. **2** shows a flat support belt loop **50** engaged with two side pulleys **54** and a third pulley **56** which is attached to treadmill **10** frame. Two springs **52** pulling in opposite directions hold belt **50** taut with a flat top configuration in contact with bottom treadmill belt portion **26A**. Since pulleys **54** and **52** are low friction, and there is no relative movement between belt **50** and belt **26**, belt **50**

mill, said handle bar assembly help users who are balance-challenged to use said motor-less, leg-powered curved treadmill.

**6**. The motor-less, leg-powered curved treadmill as in claim **1** wherein each said slat includes at least one fin descending downward from each said slat.

**7**. The motor-less, leg-powered curved treadmill as in claim **6** wherein each said slat includes a plurality of fins descending downward from each said transverse slat.

**8**. The motor-less, leg-powered curved treadmill as in claim **6** wherein each said rows of peripheral bearings are spaced apart from each other on respective left and right sides of said curved treadmill, wherein further said fins of said slats extend cantilevered downward into a vacant mid-section of said treadmill from each said slat so that said slats are resilient to dip slightly under the weight of a user runner without any lower support below non-peripheral mid-sections of said slats.

**9**. The motor-less, leg-powered curved treadmill as in claim **1** wherein said transverse slats are made of a material selected from the group consisting of rubber, plastic and wood.

**10**. The motor-less, leg-powered curved treadmill as in claim **1** wherein respective adjusters are provided on at least one set of said pulleys to adjust the distance separating said pairs of front and rear pulleys to insure precise smooth movement of said belt over said pairs of front and rear pulleys.

**11**. The motor-less, leg-powered curved treadmill as in claim **1** further comprising level adjusters extending down from said frame to adjust the tilt of said motor-less, leg-powered curved treadmill.

**12**. The motor-less, leg-powered curved treadmill as in claim **1** wherein said means for slackening the upper portion while simultaneously keeping the lower portion taut, preventing said lower portion from drooping down during rotation and exertion of walking or running force upon said upper concave portion of said closed loop treadmill belt comprises at least a pair of linear arrays of bearings extending along and located at opposite peripheral edges of said treadmill frame, each said array of peripheral edge bearings physically supporting said lower portion of said closed loop treadmill belt in a taut non-drooping configuration.

**13**. The motor-less, leg-powered curved treadmill as in claim **12** wherein said linear array of lower peripheral bearings supporting said lower taut portion of said curved treadmill belt are each attached to respective right and left side frame members of said chassis to prevent drooping of said lower portion of said curved treadmill belt.

**14**. The motor-less, leg-powered curved treadmill as in claim **1** wherein said closed loop treadmill belt having an extension wing including a v-belt portion,

said slats of said closed loop treadmill belt joined to said closed loop treadmill belt having said v-belt portion, said v-belt portion insertable and riding within a corresponding v-shaped groove within each of said front and rear pulleys.

**15**. The motor-less, leg-powered curved treadmill as in claim **14** wherein each said v-belt portion of said curved treadmill belt includes a short outer extension and a longer inner extension on each side of a v-shaped portion of said v-belt portion, wherein further one or more bolts fasten said longer inner flat belt extension to a respective end of each said slat, wherein said v-shaped portion of said v-belt portion is positioned within said respective v-shaped groove of each said pulley, wherein further a respective ball bearing of said concave peripheral row of ball bearings support a respective edge of said curved treadmill belt.

**16**. The motor-less, leg powered curved treadmill as in claim **15** further comprising a plurality of centrally located v-belt idler pulleys keeping said extensions of said curved treadmill belt from moving laterally from said pulleys.

**17**. The motor-less, leg-powered curved treadmill as in claim **16** wherein the respective weight of said curved treadmill belt keeps respective peripheral edges of said treadmill belt in contact with the respective concave contours of said peripheral ball bearings at any speed from stopped to full running speed.

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